

METHODOLOGICAL PROPOSAL FOR ELABORATION OF LEARNING MATERIALS IN SIGN LANGUAGE IN UNIVERSITY TEACHING

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ABSTRACT

Hearing impairment may constitute a barrier for accessing to information and communication in public places. Since the oral communication forms the basis of the learning process, this problem becomes of particular relevance at schools and universities. To cope with this situation is not enough to provide a textual translation for people with hearing disabilities, society via educational authorities must facilitate alternatives that improve access to information and education to this collective. According to this reality, the possibility of having an alternative tool of communication based in the Spanish Sign Language (SSL) emerges as a contribution to help overcoming the communication obstacles that the students with this difficulty usually find. The spanish law 27/2007 recognizes and regulates that the sign language has to be used as the means of support for oral communication for deaf, hearing disability and deaf-blind people. It also determines the rights of the people to decide loosely how to communicate, to not to be discriminated because of it and lays different application areas. According to this law, the design of a communication system based on SSL is proposed, with the aim of contributing to the Universal Accessibility as indicated by the International Convention on the Rights of the Persons with Disability.

KEYWORDS

Avatar, Hearing impaired, Higher education, Integration, Rotoscoping, Sign language.

1. INTRODUCTION

Inside the group of hearing impaired people, many of them, as first way of communication and in some cases as the only way, use the sign language. In this sense, Fuertes and others indicate that the access to higher education is "one of the most complex problems that the groups of hearing impaired people have to face" [1]. The same authors show that to solve this problem, it is required "the combination between the Spanish language and the SSL".

Obviously, the access to higher education is an integration problem and not about intelligence for the hearing impaired. In their path arriving to university, many students that have had this disability since they were born have been using the SSL as their habitual language of communication. However, when applying to the higher education, they find a model of communication based in the oral and written language which is used by the people without disability and that it is not adapted to their necessities and knowledge.

In the particular case of people that do not feel comfortable with this disability, it is necessary to put at their reach all the available resources to access information "to the knowledge and independent learning, without which the technologies of information and communication, which may be an opportunity, become a new barrier" [2]. An example of this could be in the widely attended public places (airports, subway stations...) where the messages of general interest for the users are not received by everybody easily. For some of the people who suffer hearing disability it is difficult and in many cases is impossible to receive those messages. Things like this make us think in the new technologies, with international design patterns, favoring a true framework of inclusion in the society [3]. In this sense, over the last few years many

improvements have been created to facilitate the communication and the access to information for the people who suffer hearing disability. Between these facilities, it stands the installation of magnetic loops in public places to provide audible information that makes it clearer for the people who use hearing aid or cochlear implant. However, these interventions do not completely solve the communication problems which people who only use the sign language as the only way of communication usually encounter.

As it is known, “there is not a universal sign language” [4]. Every country has its own sign language. Even inside every Spanish community there are variants of this language. Due to this situation, for the creation of the application which is raised, the Spanish language was selected as the official language in the Law 27/2007, in the 23rd October, which states that the Spanish sign languages were recognized and the means of support for oral communication for deaf, hearing impaired and deaf-blind people were regulated [5]. Inside Spain, there are some variations between the sign languages that are used in the different parts of the country, exceptionally Cataluña, where those are more significant.

Nowadays, the majority of universities use virtual learning platforms to support classroom teaching and, in some cases, “e-learning” for distance learning. These systems can contribute as a support tool to the group of hearing impaired, independently of the education levels they are in. The objective is to obtain the information that is given in class and to deepen in it more carefully. However, this solution does not completely solve the problem neither in the classroom nor in the learning platform, as both of these options do not give support tools based in the sign language [1].

2. PURPOSE AND OBJECTIVES

The purpose of the study consists in the integration of the students with a significant hearing impairing and those who use the SSL as their way of communication through the projection of subtitled videos, where an avatar presents the translation of the oral expositions that the teacher have created in sign language.

The proposal raised here consists in an inclusive intervention which can be implemented in any learning level, from primary school to higher education. In this case, it focuses on a university for the higher knowledge and its performance. With this proposal, it is almost simultaneous that the oral expositions which the teachers imparts in the classroom are shown with videos in sign language, which expose the same contents and even introduces the subtitles with the corresponding text, but translated to SSL to cover a broader spectrum of communication. Also, these videos will be in the virtual campus, with the rest of the documentation of the subject. With this action we pretend to facilitate the access to the information to the students with this disability, contributing to the independence and integration of these people in the society, as well as the improvement of the quality of life and the fulfillment of the “Universal Accessibility of the people with disability”.

It is a pilot project due to perform in a concrete subject. To start up this intervention, we will choose a place where there are students who have this disability and demand support through the SSL. The design requires a coordinate action between the teachers and the Office of Learning support (GAP) of the UPGC, who will give the necessary support for the preparation of the exposed texts through the subtitles in the videos and will be responsible for the translation to SSL.

The recording of the translations will be made separately for each class session. Then a multimedia installation will be performed by inserting subtitles and converting the real image into an avatar. The use of an animated character in two-dimensions (2D) is justified with the goal of dispensing real people's faces and avoids the monotony in audiovisual generated animations. In this sense, we have taken into account the positive valuations that the members of the Association of People with Hearing Disability in Gran Canaria did, who were asked about the project. 84% of the people asked, did agree with the use of an avatar in 2D instead of an individual.

In turn, for each class, small videos explaining each section will be performed. This way, we will have multiple videos of short duration for each topic of the class, which you can access through a graphical environment that allows the organization per unit and paragraph referenced within each topic. The performance of the graphical environment will aid the students to locate and access in a structured and fast way the concept he wants to play. Likewise, the use of the short duration videos is aimed at avoiding the distraction during the view or an excessive tiredness at the time of its viewing.

Finally, the inclusion of subtitles comes motivated by the possibility of offering all the students the use this multimedia material to understand the explanation of the contents which are being treated, so it is not only a useful tool for the hearing impaired, but also for the rest of students.

3. METHODOLOGY

The performance of this project is structured in different stages, which keep a direct and sequential interrelationship between them: center and subject selection, faculty coordination with the GAP, elaboration of a screenplay with the preparation of the class, translation to the sign language, design of the character and the conversion of the videos to animation in 2D and the performance of an interactive graphical environment for the call and presentation of animations.

Figure 1 shows the sequencing phases of the proposed work for this project's development.

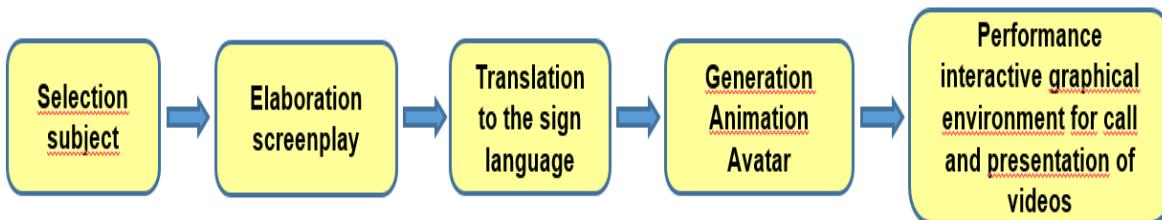


Figure 1. Phases for the elaboration of the project

3.1 Center and Subject Selection

The first step of the implementation of the project will be the selection a teaching center in which we can find students with hearing disability and they request support through translation to SSL.

Once the center is chosen, the next step will be to select the subject which is going to be intervened. A basic subject is proposed, where these students highly and where the first priority is the science. The reason of choosing a basic subject is because these subjects are imparted in several degrees of the same branch, with identical or very similar contents, so it would benefit a higher number of students. Meanwhile the predilection for the science area is justified by having a higher content of mathematic issues and fewer texts than a subject of another area, which reduces and simplifies the translation to SSL and the elaboration of a final multimedia product. Based on these arguments, the “Calculus” subject is chosen for the implementation of this pilot project, meeting the premises established.

3.2 Coordination of the Teaching Staff with the GAP

This is a multidisciplinary project, covering the teaching staff, the GAP of the university and the responsible of the audiovisuals performance. Due to this, it requires coordination between the different parts and a clear and concise planning, with the statement of each person's responsibility and a performance schedule which allows achieving the final product, with the programmed quality and in the stipulated dates.

3.3 Elaboration of a Screenplay with the Preparation of the Class

This task will take on a previous work of selection and preparation of the texts for its posterior translation to the sign language. Since in the chosen subject you have to work on a board and there are many expressions which are repeated, a previous work should be made, where those common phrases are collected. This will suppose a significant saving of the subsequent tasks. The next task will consist in the performance of a screenplay with recorded texts. The recordings will be made by the faculty, experts of the subject, who will choose texts which will be translated to SSL and will be included as subtitles in the final video. Therefore, in this phase we will analyze and synthesize the net language used as pilot project.

3.4 Translation to Sign Language

After the elaboration of the screenplay of each class and the selection of the texts, the next step in the execution of this multimedia project will consist in the translation of these texts to SSL. To perform this step, it is necessary to count with an interpreter of SSL. This task will be entrusted to the GAP, who through his Translation Cabinet is responsible of the translation of the selected material. To avoid the confusions in these phases of the project, we must record each class in different and independent videos, classifying them with the numeration and identification of each topic.

3.5 Character Design and Conversion of 2D Animation Videos

Currently there are many programs for creating vector animations easily, offering all kinds of tools which range from the most basic to others that require more skills and licensing fees. There are others which are completely free, although these generally do not have the same benefits. Depending on the level of animation it is wanted to achieve, it should be chosen the one that best suits the requirements of the final product. At this phase, an analysis of the main tools available today was made in the field of computer animation, both professional and amateur. The most common vector animation programs can be differentiated in two types: free open source, like Ajax Animator, KToon, Pencil or Synfig, and the ones which require a payment, such as Adobe Flash, Adobe AfterEffects, Anime Studio or Toon Boom, among others. In this sense, and with the goal of facilitating the choice, it is proposed the use of a specific software for animation, known as Adobe Flash CS5, which is an application shaped studio working on "frames" and it is intended to the production and delivery of interactive content. It has been used in similar projects, obtaining a high level of satisfaction.

It uses vector graphics and raster images (bitmap), sound, programs code streaming video and two-way audio. In addition, this program incorporates an animation technique called rotoscoping. Its advantage is that its use is that it can replace the faces of people, who can be more or less attractive, for an animation character.

The use of the rotoscoping in this project would be very appropriate for obtaining vector animations. With this animation and the incorporation of some of the elements in the scene as a stage, wallpaper, etc. the final videos in SSL would be obtained, in which the interpreter becomes an animated character.

In figure 2, a rotoscoping process is shown, where the conversion of video frame is performed to a 2D animation.

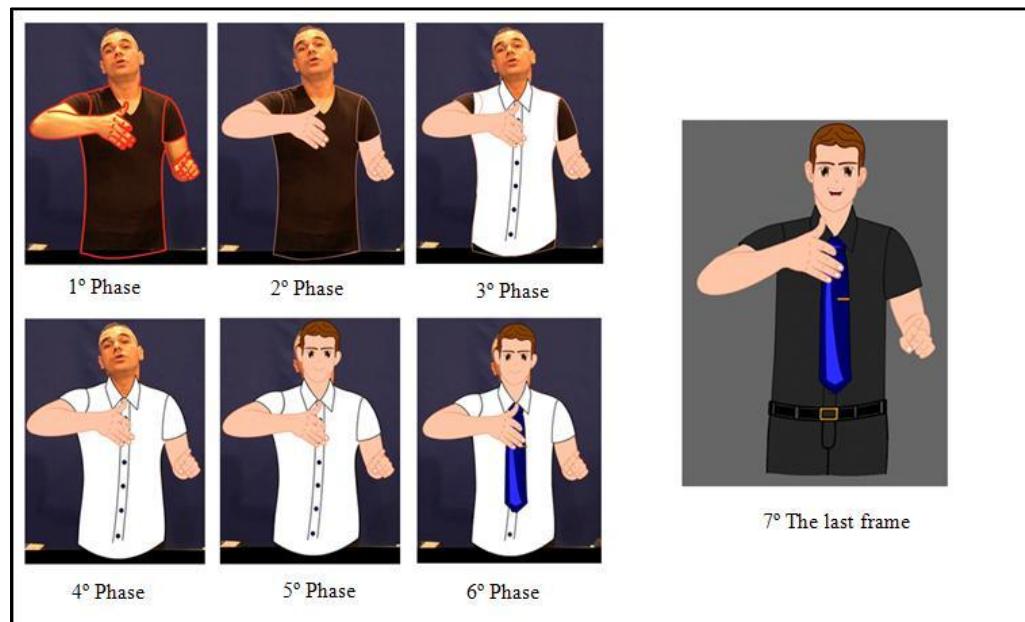


Figure 2. Changes in a single frame, during the animation process.

The animation consists of image succession, in order that when they are showed with a determinate speed, they produce the feeling of movement. Adobe Flash has some amenities when animating elements because of its interpolated animation function. The produced changes on the objects are performed easily and efficiently by setting key frames. This marks the initial and final points of the animation. Adobe Flash automatically generates the content of the intermediate frames modifying the necessary parameters, like the position, the size, the rotation or even the form of an object [7].

In the development of the videos, formal aspects must be taken care of, such as the scene background colors, the character, the speed of the gestures, the inclusion of subtitles or symbology, with the goal of capturing the users' attention.

3.6 The Performance of an Interactive Graphic Environment for the Call and the Presentation of the Animations

As it has been commented before, it is pretended to obtain short duration videos in SSL, thus leading to a large number of them. Due to this and with the goal of facilitating their identification and call in a quick and ordered way, it is proposed the creation of a multimedia app that facilitates the access to the users and the selection of the videos. It is about the design of a simple setting, interactive app which allows the interaction of the users with the shown elements in the screen, such as folders with the number and name of the topic. Inside each folder will be placed call buttons to videos, created for that particular subject. By selecting each of these buttons, which will have the name of the concept it represents, the corresponding video will start. In turn, in the videos the corresponding start, forward, pause, and final buttons should be placed. These orders will be made through a peripheral that controls these interfaces, to obtain the requested information. For the development and programming of these apps, it is proposed the software "ActionScript 3.0", which is the native programming language of Flash.

Without prejudice to what was mentioned earlier, it would be convenient, once the first version of the graphic environment is performed, to solicit opinions and suggestions from experts in SSL communication, like the GAP of the university. In this way, it would be obtained a customized product directed to the real needs and demands of the targeted population and its chances of success will be greater.

A technical detail to be considered for the correct performance of this app is that the videos in SSL should be stored in the same medium in which the multimedia application is, to obtain a greater speed in the call and reproduction of the videos.

In the figures 3 and 4 it is shown a first approximation of the proposal made for this project.

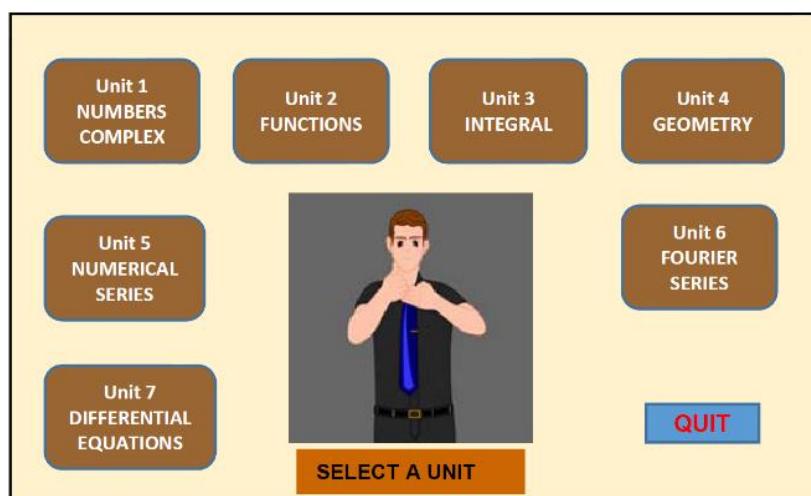


Figure 3. Principal page of the graphic environment.

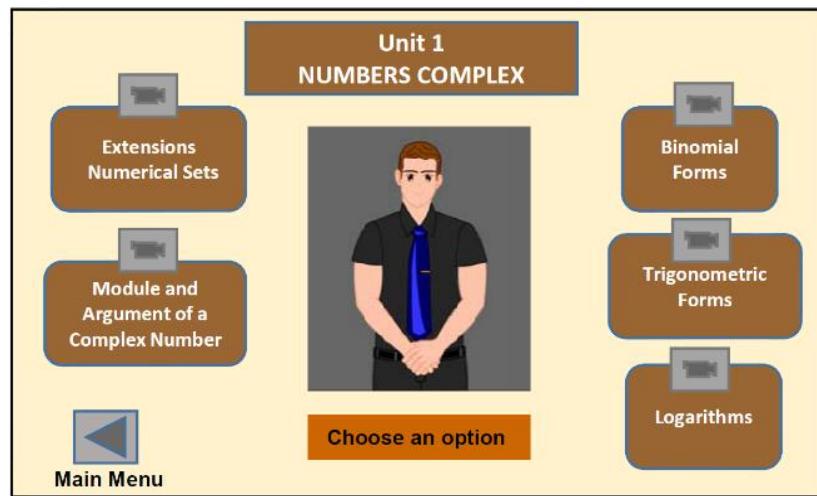


Figure 4. Screen for the selection of the videos.

4. CONCLUSIONS

The performance and implementation of this project would make the access to the information that is provided in the class to students that suffer hearing impairment easier. Furthermore, the same compliance would be given to the law on disability, in relation to "the rights of individuals to decide freely the media and not to be discriminated for it."

On the other hand, it would contribute to a didactic material in SSL available for the students which demand it in this university, and which can be shared with other Spanish university, provided that subjects chosen for translation are basics subjects, because the system of higher education is included in the European Higher Education Area (EHEA), which uniformity is required in basic subjects. Its use in an interuniversity level, would suppose that this project has impact at national level, thereby saving cost and provide a fast payback.

Once this project is implemented and evaluated, it could be made extensible to the rest of basics subjects and even extended to other degrees, especially in those subjects in which the agenda is not susceptible to significant changes.

The teaching material that is generated will be placed in the virtual campus, available to all students, so they can access it in any moment, either during the course of the class or after the them. Also, it allows the option of using multiple multimedia devices for downloading and viewing: desktop computers or laptops, tablets, smartphones, etc.

This project can be extensible to other levels of education which require teaching in SSL. It can be useful for partnerships with People with Hearing Disability, for the performance of on-line courses in SSL about issues demanded by its partners.

In the search of information for the development of this article, a large quantity of instructional videos about teaching support were found, but in any case these were teaching SSL.

REFERENCES

1. Fuertes, J. L.; González, Á. L.; Mariscal, G.; & Ruiz, C.: Herramientas de Apoyo a la Educación de Personas Sordas en la Universidad Española. *Enseñanza*, 430(45), 01. (2005).
2. Jáudenes, C.: Accesibilidad de las personas sordas a la comunicación, a la información y al conocimiento. *Accesibilidad a los medios audiovisuales para personas con discapacidad*, 43-51. (2007).

3. Parra, D. J. L.; Infante, G. R.: Tecnología de la Información y Comunicación aplicada al alumnado con discapacidad: un acercamiento docente. *Revista Iberoamericana de Educación, ISSN*, 1681-2653. (2009).
4. Ortiz, I. D. L. R. R.: Comunicar a través del silencio: las posibilidades de la lengua de signos española (Vol. 5). Universidad de Sevilla. (2005).
5. BOE, 24 october 2007, Law 27/2007, of 23 october
6. Viera-Santana, J.G.; Hernández-Haddad, J.C.; Rodríguez-Esparragón, D.; Castillo-Ortíz, J.: Interactive Application In Spanish Sign Language For A Public Transport Environment. *11th International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2014)*. (2014).
7. Corsado, S.: Flash MX animación (Los principios de la animación tradicional adaptados a Flash). Ed. Anaya Multimedia, (2003).